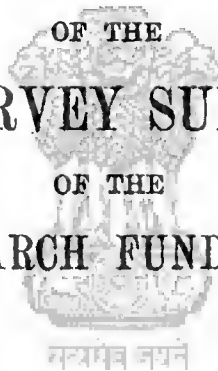


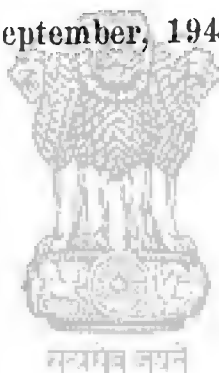
**REPORT**  
**OF THE**  
**LEPROSY SURVEY SUB-COMMITTEE**  
**OF THE**  
**INDIAN RESEARCH FUND ASSOCIATION**



**September, 1941**

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OF THE  
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INDIAN RESEARCH FUND ASSOCIATION

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*Members :*

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# LEPROSY SURVEYS

## Objects, Methods and Interpretation of Findings.

### I. INTRODUCTION.

Recent survey work in other countries and in India has indicated the occurrence of considerable variations in leprosy, particularly in the age-distribution and in the type-distribution of the cases (that is, proportion of the cases belonging to the two main groups, neural and lepromatous). It has become clear that these two factors, and probably also other factors, are of considerable importance as indications of the seriousness or otherwise of the leprosy problem, and that mere enumeration of the cases is of limited value.

It is therefore important that leprosy surveys should be carried out according to a more or less uniform plan which will provide for the collection of data covering the points mentioned above. If this is done it should be possible to compare the leprosy survey findings in different parts of the country and thus form a truer picture of the leprosy problem of India.

The question of leprosy survey was discussed at the International Conference of Leprosy, Cairo, 1938, and the report of that Conference on leprosy surveys is given in Appendix I.

At the meeting of the Scientific Advisory Board of the Indian Research Fund Association held in December 1940 was considered a resolution passed by the Leprosy Advisory Committee on the desirability of leprosy surveys being undertaken according to a uniform plan. The Board recommended that before issuing such a resolution a pamphlet should be prepared on the lines of that drawn up for tuberculosis surveys by the Sub-Committee of the Tuberculosis Advisory Committee. The following committee was recommended to draw up the pamphlet: Dr. J. Lowe (Chairman), Dr. R. G. Cochrane, Dr. Dharmendra and Dr. Isaac Santra.

Owing to the absence of Dr. Cochrane from India on leave, the work has had to be carried out in his absence.

The ground covered by this report is indicated by the title 'Leprosy Surveys—Objects, Methods and Interpretation of Findings'. The report not only deals with the principles of leprosy survey, but also with the actual practical details of the work. The report is based on practical experience of leprosy survey work in various parts of India over a number of years.

## II. OBJECTS AND TYPES OF SURVEY.

It should be emphasised that a leprosy survey should not be an end in itself but should be a means to an end, namely, the control of leprosy. The purpose of a survey should be to determine the extent and nature of the leprosy problem in the community under investigation, and to collect information which will be of help in formulating anti-leprosy measures suited to local conditions.

The term 'leprosy survey' can be used to indicate several different kinds of observations of leprosy in an area or community, and in different circumstances the type of observations and the methods used will differ widely. It is considered that there is a need for leprosy survey of three main types.

### *Survey Type I.*

This type of survey is undertaken in areas where little is known about leprosy, in order to find out the approximate incidence, the rough distribution and the main clinical and epidemiological features of the disease in the area under study, which is usually a large one, perhaps a district or a subdivision. Owing to the largeness of the area, the work is usually based mainly on the records made concerning the cases of leprosy detected in selected parts of the area. Examination of the population as a whole is not attempted.

### *Survey Type II.*

This type of survey is undertaken in areas in which leprosy is known to occur in an appreciable amount, in order to obtain more accurate and complete data regarding incidence, distribution, type-distribution, age-distribution and spread of leprosy in the population studied. The area for such a survey is smaller than that for a survey of Type I, and the survey is based on the detection and recording of, as far as possible, every case of leprosy in the area. In this type of survey also, however, individual examination of the whole population is not attempted.

### *Survey Type III.*

For purposes of special study of the epidemiology of leprosy, this type of survey may be needed. It involves the examination of every individual, man, woman and child in the area under study, with a view to getting complete and accurate information about as many as possible of the factors which may influence the disease, its forms

and its spread in the community under study. Owing to the intensive nature of the work, such studies can usually only be undertaken in relatively small populations, usually numbering between three and ten thousand.

*Other kinds of survey.*

Other forms of survey may sometimes be needed to study some special aspect of leprosy, or the influence of some special factor such as diet, housing, other diseases, industrialisation, etc., on the leprosy problem. Work of this nature has to be planned specially for the particular purpose in view, and cannot be discussed here.



### III. GENERAL NOTES ON SURVEY METHODS.

General remarks are made here bearing on all survey work. In a later section special points regarding the three main types of survey work will be discussed.

These remarks on survey methods are based on the idea that most survey work will be done in rural areas and in villages. Later is given a brief note on leprosy survey work in towns and industrial areas.

#### *Preliminary steps.*

Before a survey is undertaken it should be carefully planned. The planning authority should make quite sure regarding the indications for the survey, the objects of the survey, the type of survey that is needed, the information to be collected, and how it is to be collected and recorded, roughly how long the survey is likely to take, what personnel is likely to be required, what expense will be incurred and how such expenses are to be met.

A preliminary step before the survey is the collection of all available information regarding leprosy in the area to be studied. Such information may be available from local administrative and medical officers, local leper homes and clinics, census reports, district gazetteers, reports of previous survey work, etc.

It is also important before the work starts to secure the sympathy and co-operation of the local administration, and a preliminary visit to interview local administrative officers, local medical and health workers, chairman of district boards, union boards and their presidents, and influential members of the general public, may serve a useful purpose. It may be desirable to call together village headmen and explain the methods and objects of the work.

#### *Local assistants.*

The temporary recruitment of local men possibly voluntary workers as survey assistants may be of great value. An intelligent villager knowing intimately the area to be studied, and given a few days' training in the work, may be most useful. Local workers are often of great value in overcoming any fear and unwillingness of the people of the area to co-operate.

#### *Collection of information from the people.*

It should be realised that in many parts of India, many of the village people know well the clinical manifestations of leprosy, and

that cases of leprosy, even very slight cases, are often known as such to other persons in the village. If the confidence of the village people can be secured, this information will be given to the survey workers and the report of cases given by village people may often be complete and accurate. In the absence of such confidence, village people will often feign complete ignorance of leprosy, and the detection of cases can thus be rendered difficult.

#### *Times and seasons for survey work.*

In actually carrying out the survey everything possible should be done to secure the co-operation of the people, to inconvenience them as little as possible, and to help them as much as possible. It is desirable to carry out the survey at a time when normal activities of the village will be little interfered with. Times of ploughing and harvesting and busy agricultural seasons in general should be avoided. In certain parts of India, however, at times when there is no field work, many men migrate elsewhere for temporary work. The best time for survey work will vary in different parts of India according to agricultural and other conditions. In actual work in villages the convenience of the people should be studied as much as possible. Work in the early morning and evening, before or after the people have done their field work, is often more profitable than work during the day when the villagers are often busy in the fields.

#### *The use of compulsion.*

In some circumstances it is possible for local authorities to issue orders that on the day of the survey the people of the village are to stay in their village, and if this can be done without seriously inconveniencing the villagers it may greatly facilitate work. Sometimes, however, such a procedure will cause great inconvenience and considerable loss to the villagers, and the co-operation of the people will thus be lost and opposition and hostility may be engendered. It is often desirable to avoid the use of compulsion in this or any other form.

#### *Aids to survey work.*

One method of rendering survey work easier is to combine with it distribution of simple remedies, such as quinine for malaria and simple treatments for eye infections, dysentery, scabies and other conditions very common in villages. Another useful thing is a supply of cheap sweets to facilitate work with children.

#### *Need for accuracy in diagnosis.*

Diagnosis is briefly discussed in the Appendix III. Accuracy of diagnosis and classification is of great importance, for without this a



survey is of little or no value. A common mistake to be avoided is the recording, as cases of leprosy, of persons showing patches in the skin of doubtful nature but without the diagnostic signs of leprosy. Such patches are very common, especially in children, and may be caused by many things other than leprosy. When patches, definitely suggestive, but not diagnostic, of leprosy are seen, particularly in persons who have been in contact with infectious cases; the persons may be recorded as 'suspected' cases, but they should not be included in the list of definite cases, nor should they be considered in calculating incidence, type-distribution, etc.

#### *Examination of women.*

One source of trouble sometimes encountered in survey work is the examination of women by male workers. This should never be done without the consent of the people, and special arrangements may be necessary to secure privacy. The assistance of a local influential woman may be very valuable. It may sometimes be necessary to have a woman survey worker to examine the women.

#### *Note on survey work in towns and industrial areas.*

In towns and industrial areas, leprosy survey work by the methods described presents many difficulties. It is often difficult to secure the co-operation of the people, who will not infrequently question the right of survey workers to make the necessary enquiries, and who may attempt to hinder the work.

Even if the desire to co-operate exists, the amount of helpful information available is often very limited. The population may be large and mixed and to a considerable extent floating. Cases of leprosy are often not known as such to many other people in the town, and only leper beggars may be reported as cases of leprosy, while cases in the general population are often unknown or ignored.

For these reasons, accurate leprosy surveys of the whole population of towns or industrial areas are often difficult or impracticable. It is frequently possible, however, to gain considerable information about the incidence of leprosy in such areas by examining suitable groups of persons under control, such as school children, municipal employees and industrial workers. The value of such work, however, may be limited by the fact that severe cases of leprosy are not likely to be found in such groups, although they may be present in the town.

In towns leper beggar 'bustees' and colonies are often found, and are frequently occupied by people from distant parts of the country, often from other provinces. Leprosy survey work among such people may give little information regarding the local leprosy problem, although it may be useful in other ways.

*Prevention of unnecessary hardship to patients.*

The need for care to prevent inconvenience and loss to the general population under survey has already been mentioned. The prevention of unnecessary hardship to persons found to show signs of leprosy is often even more important, especially in towns and industrial areas and schools. Many people do not realise that most cases of leprosy are not infectious, that many are very slight and not progressive, and that contact with such cases is not dangerous. Because of this, slight non-infectious cases of leprosy detected in surveys may be dismissed from employment or forbidden to attend school.

Before undertaking survey work in industrial or other employees, or in schools, it is advisable to have a clear understanding with the authorities concerned that such action shall be confined to infectious cases. In this connection may be quoted the report on leprosy adopted by the Scientific Advisory Board of the Indian Research Fund Association, 1933.

Within recent years it has become recognised by leprosy workers that the majority of early cases of the disease as found in India are not infectious and may be expected to heal if suitably treated under favourable conditions. Fear of dismissal from employment leads to concealment; and the untreated disease may advance till the patient is a danger to his associates. Also dismissal and consequent unemployment endanger chances of recovery. We therefore consider that patients with early non-infectious leprosy should not be dismissed, provided they remain under expert medical observation and treatment.

'Available statistics show that in endemic areas the incidence of leprosy in school children varies from 0.5 to 3%. Many of these cases are not infectious. We consider that in such areas all school children should be examined for leprosy. Treatment should be provided for all definite cases found, and isolation of all infectious cases strongly urged.

'It is important that non-infectious cases should not be expelled from school, provided they remain under expert medical observation and treatment, and periodical certificates of non-infectivity are produced.'

#### IV. SURVEY UNITS, STAFF, ETC.

##### *The composition of the unit.*

The work of survey is undertaken by one or more survey units. The size of the unit and the composition of the unit will vary in different circumstances. The minimum unit consists of a doctor and a peon. For surveys of Type I or even sometimes of Type II this staff may be sufficient, provided that the time taken for survey is not of prime importance, and that the area to be studied is not too large. The quality and quantity of work can sometimes be improved by the addition to the unit of a clerk to work with the doctor in the village and record the findings made. This is particularly so in surveys of Type II and Type III. Sometimes a compounder with some clerical experience makes an excellent survey assistant. Thus the best survey unit is probably a doctor, a clerk-compounder and a peon. Provision may also be made for the assistance of a temporarily recruited or voluntary local worker to assist in survey work.

##### *Rate of work of a unit.*

In favourable circumstances with good local co-operation it may be possible for one unit to survey villages, if not too large, at an average rate of one a day, but in less favourable circumstances this will often be impossible, and villages can be surveyed at the rate of only two or three a week.

##### *The number of units needed.*

The number of units will depend on the amount of work and the time available. It may be necessary to have more than one unit. It should, however, be remembered that it is much better to have one good unit formed of keen experienced workers than two or three poor units. Good survey workers are often not easily obtained. Quality of work is more important than quantity.

##### *Doctors for survey work.*

Doctors should of course be properly qualified men with special post-graduate training in leprosy, and if possible in survey work. They should preferably be young and active, and they should have a real knowledge of, and interest in, rural life and conditions. They should be prepared to occupy simple accommodation near the villages in which they work, and they should not expect to return each night to

their headquarters or to a Dak Bungalow. Doctors should know the language or languages spoken in the area in which they are working. In areas with many languages, local assistants may help to overcome any language difficulty.

*Survey Assistants.*

These also should be men who have the ability to adapt themselves to the conditions of their work. As already pointed out, a worker with some knowledge of compounding and of clerical work is a most useful survey assistant. The duties of the survey assistants are to assist in making preliminary arrangements for work in villages, to record names, age, sex, etc., of persons examined or to be examined, to assist the doctor in the examinations, and to assist in recording the results of the examinations and in analysis of returns, etc. The survey assistant should be forbidden to undertake diagnosis and classification, work which must be done by the doctor.



## V. SURVEY TYPE I.

### *Methods.*

This type of survey is undertaken in large areas in which little is known of leprosy, in order to find out the main facts about leprosy in the area, its approximate incidence, distribution and the main clinical and the epidemiological features.

Owing to the size of the area to be studied, it is usually possible to survey only certain selected parts of the area. It is important that this selection should be properly done.

### *Selection of the parts to be surveyed.*

The part or parts must be selected in such a way that the findings made may be applicable to the whole of the area. Enquiries made locally in the area to be studied will usually indicate one or more parts in which the incidence of leprosy is reported to be relatively high, parts where there is said to be little or no leprosy, and other parts where the incidence of leprosy is said to be between these two extremes. A mistake to be avoided in surveys of Type I is to confine the survey to parts where leprosy is said to be common and to apply the findings of such a survey to the whole area.

Survey of Type I should include at least two parts, one in which leprosy is said to be common, and another in which leprosy is said to be rare. A third part of moderate incidence may also be included. On this principle different villages or different groups of villages should be selected for survey.

### *Work done in villages.*

The work in the selected villages usually resolves itself into four phases. Firstly, the securing of the confidence of the village people in various ways, by informal talks or possibly by organised propaganda such as lantern lectures and the distribution of simple literature, and getting from the people reports about cases of leprosy in the village. Secondly, examination of all reported cases, checking the diagnosis, classifying and collecting the necessary information about the cases. Thirdly, detection of other unreported cases by examination of contacts, examination of a reasonably sized group of persons of different families, ages, etc., and examination of all the village children. Fourthly, collecting information about the village and its people about the history of leprosy in the village, the ideas of the village people about leprosy, any attempts at segregation in the village, economic, social and hygienic conditions in the village, etc.

In some villages work along these lines on two or three visits will give the necessary information. It is frequently found that the first visit to a village reveals relatively little, because of the fear of the people, but the second and third visits are more productive of results since the people have more confidence. Sometimes, however, the methods already mentioned may have to be supplemented by house-to-house visits and examination of all persons in certain parts of the village, or even of the whole village. In any case, all the homes of all the infectious cases should be visited, and as far as possible all the people living in or near these homes should be examined.

#### *Records and Reports.*

*Schedule I* gives the main details regarding the surveyed villages, the work done, the cases detected, any suspected cases and the rough analysis of the findings. A separate schedule should be filled in for each village.

*Schedule II* summarises and analyses the findings recorded in *Schedule I*. *Schedule II* is intended to deal not with single villages but with groups of villages which may constitute either the whole, or one part, of the area surveyed.

*The Survey Report* should be based (a) on general information regarding the area and villages surveyed, and (b) on the information given in *Schedules I and II*.

The report should cover the following points:—

- (a) The reasons for the survey and for the selection of the particular area and villages.
- (b) A brief description of the nature of the area studied. This should include brief remarks on (1) the size of the area and its total population; (2) any special features regarding the distribution of the population in the different parts of the area; (3) chief facts about climatic conditions, temperature, rainfall collected from official records.
- (c) A brief description of the population of the area. This should include brief remarks on (1) the main points regarding race and castes, etc., of the population studied; (2) social, economic and hygienic conditions whether good or bad or indifferent; (3) common occupations; (4) endemic diseases.
- (d) Notes regarding local customs, traditions, etc., concerning leprosy with particular reference to the presence or absence of any custom or tradition of segregation of patients in homes or villages.
- (e) Aggregate returns for the villages surveyed for (1) total population, (2) number of cases of leprosy detected,

(3) incidence of leprosy based on the two above figures, (4) the type-distribution (that is, the proportion in percentage of cases of the two main types, 'neural and lepromatous'), (5) sex-distribution, (6) the age-distribution (percentage of cases in the different age-groups), (7) the type-distribution by age (the percentage of lepromatous cases in the different age-groups). These points are more fully discussed under 'Interpretation of Survey Findings'.

- (f) The differences, if any, in the incidence, type-distribution, age-distribution, etc., found in different parts of a village, in different villages, or in different parts of the area studied, should be pointed out. An attempt should be made to correlate these differences with any climatic, racial, caste, social and economic differences observed.
- (g) Other points: In some parts of India immigration of persons with leprosy is common, and it is important to indicate what proportion of the total number of cases has probably been infected in the surveyed area or adjacent areas, and what proportion of cases has been infected in remote areas inside or outside India. In favourable circumstances it may be possible to present details regarding the relative frequency of intra-familial contact, extra-familial contact and casual or unknown contact, and also regarding the frequency with which more than one case is found in the family.
- (h) An assessment of the seriousness or otherwise of the leprosy problem in the area studied should be made. This matter is discussed later.
- (i) Comments should be made regarding any existing anti-leprosy measures and the possibility of their improvement and development. Where no such measures exist, and are needed, suggestions should be made regarding what form they should take. Such comments and suggestions might cover home or village isolation work, leper asylums or hospitals, leprosy treatment centres. Local individuals, groups or organisations which are, or might be, of assistance in anti-leprosy work should be mentioned.

**SCHEDULE I.\***  
(For single village.)

District.	Thana.			Village.	
Total population.	CASES DETECTED.				Incidence per cent.
		N	I.	Total.	
	Male ..				
	Female ..				
	Total ..				

Brief Notes on nature of work done :—

Analysis of cases by type and age.					
Age group.	CASES.				Percentage of total cases.
	No.	N %*	No.	I. %*	
0-14 ..					
15-34 ..					
Over 34 ..					
TOTAL ..		(%)*		(%)*	100%

\* The percentages indicate the proportion of N and I cases in the age-group or in the total cases.

Percentages to be filled in only if cases sufficiently numerous.

Notes on leprosy in the village :—

- (a) Past history.
- (b) Distribution in different quarters, castes, families, etc.
- (c) Customs and traditions re: leprosy.
  - Can lepers marry ?
  - Are lepers isolated ?
  - If so, how many, what type and how isolated ?
- (d) Any other points, e.g. number of cases infected in distant places.

\* The above form indicates the general lines of the Schedule. In actual practice the form should be considerably larger, and should provide more space for 'Brief Notes on nature of work done' and for 'Notes on leprosy in the village'.



*List of Cases.*

**SCHEDULE I (reverse).**

Village.....

Name.	Sex.	Age.	Caste.	Type of disease.	Duration of disease.	Other cases in family.	How infected.	Other Notes.



सत्यमेव जयते  
SUSPECTED CASES.

*(Not to be included in calculating incidence, etc.)*

Name.	Sex.	Age.	Caste.	Nature of lesion.	Duration.	Definite cases in family.	Exposure to infection.	Other Notes.

*Survey Types I and II.*

**SCHEDULE II.\***

*For groups of villages and/or for whole surveyed area.*

Name and size of area covered by Schedule.	Number of villages.	Reason for survey.
--	---------------------	--------------------

Outline notes on nature and methods of survey work done :—

Total population.	Cases.			Incidence.
	N (%)	L (%)	Total.	

Age group.	CASES.						TOTAL FOR AGE GROUPS.				% in age group.  $\left(\frac{\text{Age group total} \times 100}{\text{Grand total}}\right)$ .
	N			L							
	Male.	Female.	Total.	Male.	Female.	Total.	Male.	Female.	Total.	% L case.	
0-14 ..											
15-34 ..											
35 and over ..											
TOTALS ..											

Comments on above analysis :—

**Notes on leprosy in the surveyed area.**

Distribution in the area, different castes, etc., local conditions affecting leprosy, customs, traditions, marriage of lepers, isolation of lepers, popular attitude to lepers, etc.

\* The above form indicates the general lines of the Schedule. In actual practice the form should be considerably larger, and should provide more space for 'Outline notes on nature and methods of survey work done' and for 'Notes on leprosy in the surveyed area'.

SCHEDULE II (reverse).

Village No.	Village name.	Population.	Cases.			Incidence.	Remarks.
			N	L	Total.		

## VI. SURVEY TYPE II.

This type of survey is undertaken in areas in which leprosy is known to occur in an appreciable amount, in order to obtain more accurate and complete data regarding incidence, distribution, type-distribution, age-distribution and spread of leprosy in the population studied.

### *Methods.*

The survey of this type may be undertaken to cover an area such as that of a Union Board or perhaps all villages within a radius of five miles of a centre of anti-leprosy work. The work of survey will be greatly facilitated if there is, in the area to be surveyed, a leprosy clinic to which patients can be referred for treatment, and at which clinical and bacteriological examinations can be made if necessary.

The essential difference between surveys of Type I and surveys of Type II is that every village within the area is to be surveyed and not merely sample villages. This is made possible by the relatively small size of the area studied. The methods of work are practically the same as for surveys of Type I and need not be discussed in detail. The work, however, should be more intensive and the details collected more complete and accurate.

### *Records and Reports.*

The records should be similar to those of Survey Type I but should refer to all the villages in the area surveyed and not merely selected villages. Schedule I should be filled up for each village. Schedule II should be filled up for groups of villages and/or for the whole area, and the report should cover ground similar to the Survey Report of Type I survey, but should be more detailed.

## VII. SURVEY TYPE III.

### *Methods.*

A survey of this type is a complete and accurate study of leprosy in a population and is based on the examination of every man, woman and child in the population to be studied.

As has already been stated, survey of this type is really a piece of epidemiological research. The survey and its records should be planned, the survey carried out and the data collected and analysed either by workers with wide experience of leprosy, epidemiology and statistics, or by other experienced workers after full consultation with experts in these matters. The actual survey has to be carried out by an expert survey unit.

In the selection of an area for such a survey various points have to be considered. The area should be one in which the incidence of leprosy is sufficiently high to produce the necessary data. In this type of survey the co-operation of the people is of the greatest importance, and such work should not be undertaken where such co-operation may not be secured. The work will involve careful clinical examination of many persons and possibly laboratory examination, and hence should only be undertaken in areas where facilities for this are already available or can be provided.

The size of the population which can be studied by such methods within a reasonable time, perhaps three months to nine months, will usually vary between five and ten thousand, but careful studies of smaller populations may be of value.

The work is best done village by village, the worker not beginning to survey a second village until the survey of the previous village has been completed.

A complete census of the village is necessary with a list of every man, woman, and child, family by family, with details regarding sex, age, caste, etc. The whole census may be made before the actual examination of the people is started, or else the work may be done house by house, a list of inmates being made, each person being examined and questioned, and the findings recorded in the schedules mentioned below. The work is not really complete until every recorded inhabitant of the village has been examined. In practice, however, a few people may be found temporarily absent, and may have to be examined at a later date, after their return.

### *Records and Reports.*

A survey of Type III will involve the collection of information covering many points concerning the village as a whole, the different communities in the village, the different families and every person in the village whether healthy or leper, with special records of every case of leprosy. The records should take the following form:—

(1) *A General Schedule* for every person in the area studied. This schedule should give the serial number of the person examined, the village number, the family number, the name, the father or husband's name, the name of the head of the family, the age, the sex, the marital state, the caste and occupation. It should also state whether the person is suffering from leprosy or not, and if so, should give the number of the Case Schedule. Details regarding exposure to leprosy infection should be given and should include the presence or absence of a history of contact with an infectious case (*a*) in the commensal family, (*b*) in other relations, (*c*) with non-relations inside the home, (*d*) contact outside the home. Details should be given of the closeness of the contact, the duration of contact and the age of the person when contact first occurred. The schedule should also mention any cases of leprosy in the family or in relations.

(2) *A Case Schedule* to be filled in for every person found to be suffering from leprosy. This schedule should have its own number and should quote the number of the patient's General Schedule; should give the patient's name and age, family number, village number; should give the classification of the case, results of bacteriological examination, and brief clinical details; should state whether the patient is under treatment and/or isolation; should give the history of the disease, the age at which the first lesion appeared, the nature of the first lesion and a summary of the subsequent developments.

These two schedules should preferably be in a form suitable for analysis by mechanical methods.

(3) *Village records* should include the following: A sketch-map of the village with the cases of leprosy marked; figures for the area of the village and for the total population of the village and for the different communities, different sexes and different age-groups; some account of the density of the population, social, economic and hygienic condition in the village, etc., figures for the incidence of leprosy and the type-distribution of leprosy in the village as a whole, in the different parts of the village and in the different communities, in the two sexes and in the different age-groups; the main findings in the village regarding the relative frequency of intra-familial, extra-familial, casual or unknown contacts as causing transmission of the disease; remarks on any attempts at segregation of cases in the village; a list of all the cases detected and the main points regarding the disease, how contracted, duration, type, etc.

*Reports.*

An *outline report* on Survey Type III may be made on the basis of the findings recorded in the schedules and in the village books, and may be drawn up on similar lines to Reports of Survey Types I and II, but this will cover only the main points of the survey.

*Detailed Report.*—This should be based on careful analysis, usually mechanical, of the General Schedules and Case Schedules.



## VIII. ANALYSIS AND INTERPRETATION OF SURVEY FINDINGS.

When a survey is completed and the main findings are established the question arises of the meaning and significance of the findings as indications of the importance or otherwise of leprosy as a public health problem in the area studied.

The limitations of mere incidence figures have already been pointed out. Other things being equal, a higher incidence is of course more serious than a low incidence; but a high incidence of leprosy of the mild type, particularly in adults, may be less serious than lower incidence of leprosy in its severer forms, especially if numerous children are affected.

A survey report should, therefore, give information not only regarding incidence but regarding the type-distribution, age-distribution, and the type-distribution at different ages. From a study of these findings it may be possible to express an opinion whether the disease is found in slight or severe forms, whether the slight forms are likely to develop later into the severe forms, and whether the disease is likely to increase or not. Reliable survey reports may give us indications on these points.

### *Incidence.*

The incidence of leprosy in surveys of Types I and II should be calculated on the basis of the number of cases recorded and the total population of the villages studied, not the number of persons examined. In surveys of Type III the figure for incidence should be based on the number of cases detected and the number of persons examined which should be practically the whole population.

The incidence of leprosy recorded in various surveys in different parts of India varies very markedly. In the north-west part of the country in the plains the incidence is commonly very low but in the Himalayan foot-hills it is higher, while in the southern and eastern parts of India an incidence of 2, 3 or 4% has frequently been recorded and the highest incidence so far recorded is 7.4%. These figures relate not to single villages but to groups of villages or larger areas.

The incidence of leprosy in the endemic areas of India particularly in the south and east is definitely high, probably as high as is found in any other country in the world which is comparable in size, but, on the whole, leprosy in India is seen in forms which are considerably milder than those seen in other countries such as China, Japan, Philippine Islands, United States, South America, Burma, etc. (Africa, however, is an exception). Therefore leprosy may not be as serious a problem as would appear from the figures for incidence.



### *Type-distribution.*

The figures for type-distribution are obtained by taking the total number of cases and dividing them into two types 'neural' and 'lepromatous', recording the percentage of each type. The type-distribution may also be indicated by merely quoting the proportion of cases of lepromatous type, the proportion of neural cases being the remainder.

It may be useful to sub-classify the main types according to the degree of involvement (as N-1, N-2, N-3, L-1, L-2, L-3) and to study the relative proportion of the cases in these different groups. Other methods of sub-classification may also be used and these are described in Appendix II.

In survey work in different parts of India the proportion of lepromatous cases has been found to vary very markedly from about 4% to over 50%. On the average in most parts of India where leprosy is common the figure is usually between 20% and 25% but reports indicate that in other endemic areas, e.g., Madras, it may be higher.

These figures for type-distribution may be compared with figures reported from other countries. The only other country which reports such a low proportion of lepromatous cases is Africa and here in many parts the proportion may be even lower than in India. In most other endemic countries, Japan, China, Burma, Philippines and America, the proportion of lepromatous cases is usually much higher, usually 50% or more, although the total incidence is often lower than in India. It has been suggested by various workers that in areas where leprosy is increasing, the proportion of lepromatous cases is high, and where leprosy is diminishing it is low, and where a stationary condition is found it is between these two extremes. It is difficult to say whether findings in India support this view, for we have no reliable information regarding increase or decrease of leprosy in India.

### *Age-distribution.*

It has been suggested by some workers in India and in other countries that where leprosy is increasing, not only is the lepromatous form of the disease relatively common, but also a relatively high proportion of cases is found in children; while where leprosy is diminishing the reverse may be found, a low proportion of lepromatous cases and relatively few cases in children. Here again, in the absence of reliable information regarding increase and decrease, it is difficult to say whether these views are supported by findings in India.

However, useful information may be obtained by analysing the recorded ages of all the cases of leprosy found in the survey. The method of analysis may vary somewhat according to the number of cases, and the accuracy of the returns of the ages, for age reports are often very inaccurate.

The simplest method is to divide the cases into two groups:

those under the age of 15,\* those aged 15 and over. Sometimes it is useful to divide the cases into three groups of comparable size, under 15, 15-34, and over 34. In surveys of Type III a more detailed age-grouping may be used as suggested in the Cairo Congress Report (see Appendix I). The figure for the percentage of cases under the age of 15 is sometimes referred to as the 'childhood rate'.

It has been found that the figures for 'childhood rate' vary rather markedly in different surveys from 4% to 50%. Where leprosy is both common and severe, the percentage of cases in children is usually high and the percentage in old people is low, probably because patients rarely live to old age. Where leprosy is mild, even although common, the percentage of cases in children is usually low and in old people may be high, probably because the mild disease does not apparently shorten life. Such findings have been made in the plains of India but in some parts of India, including the northern hills, leprosy may be relatively common and severe, but there is not a high incidence in children.

There is some evidence that in some parts of India the age-distribution may be influenced by the return of emigrants with leprosy from highly endemic areas, such persons being almost always adults.

The significance of the age-distribution of leprosy in different circumstances is a matter which needs further study.

#### *The type-distribution in relation to age.*

If, in addition to grouping the cases in two or more age-groups, we study the proportion of cases of lepromatous type in each of these age-groups, additional information of value may be gained. In most parts of India so far studied, slight cases of neural type predominate in all age-groups and such a finding indicates the relative mildness and non-progressive nature of the disease in many cases. In areas where leprosy takes on its more severe forms, cases of lepromatous type may not be uncommon in children, and may form a large majority of cases in adult life, but in old age leprosy though rare may be chiefly of the neural type. A finding of this kind may indicate that many of the slight cases in children become severe lepromatous cases in adult life, and that such cases do not live to old age.

Thus a study of type-distribution by age may give useful indications as to whether or not the disease is commonly of a progressive nature.

#### *Evidence of increase or decrease of leprosy.*

The possible value of the type-distribution and age-distribution of the cases found in leprosy surveys as indications of the probability of increase or decrease in leprosy has already been discussed. It is suggested that a high proportion of lepromatous cases together with a high proportion of cases in children indicates increase, while a low proportion of lepromatous cases together with a low proportion in

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\* This age was fixed by the Cairo Conference as demarkating childhood from adult life.

children indicates decrease. Until accurate information is made available regarding increase or decrease of leprosy in different parts of India, these suggestions will remain as suggestions only.

In addition some information regarding the increase or decrease of leprosy in an area may be obtained from the census figures and other local records. The Government of India census taken every ten years from 1871 contains reports of the number of lepers found in each administrative area. (The 1931 report quotes the figures from 1871. In 1941, however, the census of cases of leprosy was given up.) These census figures are, of course, grossly inaccurate, and the degree of inaccuracy in the different censuses may vary markedly, and therefore the figures may give little indication regarding any tendency of leprosy to increase or decrease.

It is worthy of note, however, that between 1871 and 1921 although the population of India increased by 50% the number of cases of leprosy recorded in the census did not increase. In 1931 however, the census recorded an increase of 50% or more in the number of cases recorded in many areas. It is probable that most of this increase is due to more accurate enumeration owing to the increase in leprosy survey and propaganda work during the previous decade.

Statements regarding increase or decrease of leprosy may be obtained during surveys from local inhabitants, particularly older persons. Such reports, however, are usually of little or no value. In endemic areas almost invariably a survey worker will be told that leprosy was rare in the past and is now common. The inaccuracy of many of these reports is shown by the fact that such statements will frequently be made regarding areas which have been notorious for leprosy for many years and which showed a high number of lepers in the 1871 census. Such statements are apparently merely a manifestation of the general tendency of man to idealise the past and to criticise the present. On the whole, there is no sound evidence to support the idea that leprosy is much more common in India than it used to be. While it is probable that in certain areas an increase of leprosy has occurred, possibly as the results of increased migration, it is also possible that in other areas leprosy has diminished.

## IX. RECOMMENDATIONS FOR ANTI-LEPROSY WORK BASED ON SURVEY FINDINGS.

As already stated, leprosy survey work should not be an end in itself but the means to an end, the control of leprosy. An important duty which may have to be performed either by the doctor carrying out the survey, or by the administrative officer to whom the survey report is submitted, or by both, is the making of recommendations regarding what shall be done about leprosy in the area surveyed.

The analysis and interpretation of survey findings has already been discussed. In some areas a leprosy survey will indicate that leprosy is either so rare or else so slight that it does not constitute a public health problem of any great magnitude, and in such areas recommendations may be confined to simple measures for providing for diagnosis and treatment of cases, possibly in local hospitals and dispensaries, and also for some simple isolation measures for infectious cases.

In other areas, however, leprosy will frequently be shown by survey work to be a serious public health problem. In such areas the putting into force of a carefully considered programme of anti-leprosy work may be recommended. Such recommendations might cover any or all of the following points:—

- (a) The provision for isolation of infectious cases of leprosy in homes, villages, in colonies or institutions.
- (b) Provision for diagnosis and treatment of cases of leprosy in the area through existing medical agencies, hospitals, dispensaries, or in special leprosy clinics.
- (c) Provision for suitable leprosy propaganda in the leprosy clinics and in the villages and homes of patients.
- (d) The part to be played in anti-leprosy work by official agencies, local authorities, voluntary bodies, etc.
- (e) Suggestions for the formation of a local voluntary organisations for furthering anti-leprosy work, and suggestions regarding methods to be adopted by such organisations.
- (f) The necessity for further survey work, the areas in which it should be done and the type of survey needed.

These and other points may be the subject of recommendations in areas where leprosy may be a serious problem. It should be strongly emphasised that the most important thing is to attempt to secure a reasonable degree of isolation of infectious cases of leprosy, particularly from children and young people, and to create in the villages a public opinion which will insist on this isolation being established and maintained.

## X. RE-SURVEY OF PREVIOUSLY SURVEYED AREA.

It has already been pointed out that our knowledge of certain aspects of the leprosy problem is very limited. In any given area it cannot be said whether leprosy is increasing or decreasing. It has been stated that certain epidemiological findings are suggestive of increase of leprosy while other findings are suggestive of decrease, but until more information is available the soundness of these views cannot be established.

The only way in which such information can be gained is by accurate survey, repeated, if necessary, several times, at intervals of at least five years.

The number of areas accurately surveyed in India is at the present time very small, and sufficient time has not yet elapsed to make a re-survey of these areas of great value. It is however probable that in the future, re-survey of previously surveyed areas will become a matter of considerable importance. It is therefore advisable in this report to mention the main principles of such work.

The first essential is that the original survey should be thoroughly done, and the findings accurately and completely recorded in a permanent form, so that they may be available when the time for re-survey comes. In practice this means that the original survey must be of Type II or Type III, and not of Type I which is too rough and covers too wide an area.

The second point is that the re-survey should be at least as thorough as the original survey and the methods of work should be the same and the findings recorded in the same way.

The report of the re-survey should cover the same ground as the report of the original survey, but should in addition give information on the following points:—

- (a) The present condition of the individual cases reported in the previous survey:—how many are dead, how many have left the area, how many remain; in how many the disease has advanced, remained stationary, retrogressed or become inactive.
- (b) The number of persons with leprosy who have moved into the area.
- (c) The number of new cases arisen in the area since the previous survey, the history of contact, the age at onset, the clinical condition and the classification of such cases. It should be stated whether these persons were examined

in the previous survey and whether they were then suspected as possible cases.

- (d) Variation in total population since the last survey.
- (e) Any variation in total incidence of leprosy, type-distribution, age-distribution, age-distribution of the types, since the last survey.

If the data of the original survey and of the re-survey are of sufficient accuracy, such work may provide information of real value regarding the leprosy problem, its tendency to increase or decrease, the epidemiological findings associated with such increase or decrease, and the value of anti-leprosy measures in force.



## APPENDIX I.

### EXTRACT FROM REPORTS OF SUB-COMMITTEES OF THE INTERNATIONAL LEPROSY CONGRESS, CAIRO, 1938.

#### RECOMMENDATIONS FOR EPIDEMIOLOGICAL INVESTIGATIONS.

##### *Incidence.*

The incidence of leprosy should be taken as the number of cases per thousand of the total population. It must be specified upon what information the incidence is based. (a) This must include the total number of persons residing in the area under consideration. (b) The total number of persons examined must be stated: any discrepancy between the total population and the number examined should be explained. (c) Cases in isolation should be assigned to the area in which they were living at the time they were isolated. (d) All cases of leprosy diagnosed as such by the examiner, including quiescent and arrested cases, should be recorded.

##### *Age groups.*

The following age grouping should be used: 0-4, 5-9, 10-14, 15-19, 20-29, 30-39, 40-49, 50-59 and 60 or more years. A 'child' is to be taken to mean any person falling within the first three age groups.

##### *Sex incidence.*

By the sex incidence of leprosy is meant the number of male cases per thousand and the number of female cases per thousand of the population examined.

##### *Types of survey.*

It is recognised that there are two main types of survey: (a) extensive or general, and (b) intensive or particular.

##### *Extensive or general surveys.*

Such surveys may be based upon the incidental examination of known cases of leprosy by official and others, or upon the examination of certain groups, as for example, school children, prisoners, conscripts, or upon the examination of contacts of known cases.

### *Intensive or particular surveys.*

An intensive survey depends upon the complete examination of the entire population by a trained personnel. In such a survey it should be stated whether the examinations were conducted in the clinic or in the persons' own homes.

### MINIMAL EPIDEMIOLOGICAL DATA.

The committee recommends that the information for standard epidemiological studies be recorded in two main groups: (1) general, and (2) individual. The latter concerns both (a) all of the individuals in the area surveyed, and (b) the lepers and leper suspects.

#### *General information.*

The following general information regarding the region and the people is required: (a) Climate, meteorology and soils; (b) geography and topography; (c) racial groupings; (d) general, social and economic conditions; (e) diet; (f) housing and sanitation; (g) hygiene-habits of the community; (h) clothing; (i) prevalent occupation (agriculture, fishing, etc.); (j) prevalent diseases (epidemic or otherwise); (k) birth rate, death rate, and infant mortality rate when available; (l) density of population; (m) history of leprosy in the community; (n) native folk-lore, traditions, customs and superstitions regarding the disease.

#### *(a) Information concerning individuals.*

*Information regarding all individuals examined.*—The following information is required for every individual in the area surveyed: (1) Serial number of individual. (2) House number. (3) Name. (4) Age. (5) Sex. (6) Race, caste, religion. (7) Relationship to head of family. (8) Physical examinations: malnutrition, skin diseases, other diseases including leprosy, definite or suspect (for lepers and suspected lepers see below). (9) History of contact with lepers as indicated below.

#### *(b) Information regarding lepers and suspects.*

The following information is required concerning lepers and suspected lepers: (1) Previous illness. (2) Leprosy contact history: (i) intra-familial and/or household contact (bed contact, room contact, house contact including joint-family system), stating family relationship; (ii) extra-familial (intimate or casual); (iii) contact not known. (3) Contact period: (i) time since first known contact; (ii) time since last known contact; (iii) duration of contact; (iv) contact continuous or intermittent. (4) Particulars about presumed source of infection. (5) Age at onset of first manifestation of leprosy. (6) Course of disease. (7) Present status, description and type of disease including site of initial lesion. (8) Laboratory findings, examination of smears and if



possible of sections, and serological tests. (g) Conclusion: (i) leprosy definite; (ii) leprosy, suspected.

#### METHOD OF CONDUCTING AN INTENSIVE SURVEY.

It is essential that the area chosen for a survey be sharply delimited, and if possible it should coincide with an administrative area. In brief, there may be said to be two steps in an intensive survey. First, there must be a complete enumeration or census of the chosen area by a sanitary inspector or assistant, preferably someone with sufficient preliminary training in leprosy work to enable him to recognise obvious lesions of the disease. The second step is the careful examination of every individual in the area by a leprologist, and the recording of data on appropriate forms.

*Preliminary examination or survey.*—The enumerator should conduct a house-to-house census of the area, recording his findings in some type of census book or on a family card. The houses are to be given numbers and a map of the area should be drawn, roughly to scale, indicating streets, lanes, houses (with numbers), streams, public latrines, etc. It should be made the practice that the inspector see every individual, and that he do not record data on hearsay evidence.

*Clinical examinations.*—After the preliminary survey has been completed the leprologist proceeds to examine all persons in the area. It is probably best to have some building near the centre of the area set aside for use as a clinic, where as many as possible of the population should be examined. In the examination the whole body should be inspected, the clothing having been removed, and when that is not done record should be made of that fact. The examiner's findings in each case are to be recorded in the survey book, and in addition, when leprosy is present or suspected, a separate examination form should be filled in. The preliminary data recorded by the inspector should be checked, and more detailed information obtained. With non-lepers, as well as with those suffering from the disease, an effort should be made to determine whether or not there has been any previous contact with lepers. When there has been such contact, its time and duration as well as its nature should be ascertained. Such information is to be obtained by questioning and from the records after the completion of the survey. Its collection may present considerable difficulty.

#### DERIVATION OF RATES.

Certain leprosy indices which may be valuable can be derived from survey data. These are:—

- (1) The *case-type rate* which is the number of open cases per 100 cases of leprosy.

- (2) The *sex rate* which is the number of male lepers per 100 cases of leprosy.
- (3) The *childhood rate* which is the number of child lepers per 100 cases of leprosy.
- (4) The *contact rates* which are (a) the number of lepers with familial (household) contact per 100 cases of leprosy; (b) the number of lepers with extra-familial contact per 100 cases of leprosy; (c) the number of lepers with contact unknown per 100 cases of leprosy.

Further correlation, such as the ratio between case-types and sex, etc., may be derived from these data at the discretion of the investigator.



## APPENDIX II.

### NOTES ON CLINICAL MANIFESTATIONS OF LEPROSY AND CLASSIFICATION OF CASES OF LEPROSY.

These notes are intended merely for the guidance of survey workers. Such workers should have had a thorough training in some centre of leprosy work, and should possess more detailed knowledge than can be given here.

Leprosy shows itself clinically in two main forms to which the term 'neural' and 'lepromatous' are applied.

#### *Neural Type.*

The lesions of neural type can be divided into two varieties for which the terms 'macular' and 'anaesthetic' are used.

(1) *The macular variety of neural lesion.*—There appear one or more patches, usually clearly defined showing the following changes: (a) loss of pigment; (b) diminution in cutaneous sensibility; (c) sometimes thickening and erythema in the margin, thickening often being irregular and the margin papillated; (d) sometimes thickening of the cutaneous nerve supplying the patch. To the patches showing thickening, papillation, etc., either at the margin or else more widely, the term 'tuberculoid' is often applied.

There may be only one patch or there may be many patches covering much of the body. The patches may vary greatly in size and shape, and may be found anywhere in the body.

(2) *Anaesthetic variety of neural lesions.*—This variety of neural lesion is associated with the involvement of the nerve trunks of the hand and arm, leg and foot, and sometimes face.

The affection in the nerve trunks causes (a) impairment of cutaneous sensibility in the distribution of the nerve; (b) sometimes paresis or paralysis, and wasting of muscles supplied by the affected nerve; (c) sometimes deformity and trophic lesions and ulcers in the affected part.

The commonest nerve trunks to be affected are the ulnar nerve, the peroneal nerve, the posterior tibial nerve, the great auricular nerve. Other nerves may also be affected. The affected nerve or nerves are often thick, painful and tender but may later become fibrosed and thin.

(3) *Classification of neural cases.*—Patients in whom all lesions belong to the two main varieties described are classified as 'neural' (N). They may be further sub-classified as 'neuro-macular' and 'neuro-

anaesthetic' and also the degree of involvement may be shown by figures 1, 2 and 3.

Thus a case classified as  $Nm_1$  shows one or a few patches;  $Nm_3$  indicates very numerous and extensive patches;  $Nm_2$  indicates a condition between these two extremes. Similarly,  $Na_1$  indicates the existence of mild or limited nerve trunk involvement.  $Na_3$  indicates nerve trunk involvement and deformities and trophic lesions in all the limbs and possibly in the face.  $Na_2$  indicates a condition between these two extremes. A patient with both 'macular' and 'anaesthetic' lesions may be classified, for example, as  $Nm_2a_2$ .

In accurate survey work it is advisable to record the different clinical varieties of the patches of neural type. Neural patches in which there is definite thickening, erythema, papillation, etc., may be classified as  $Nt$  (tuberculoid). Flat patches in which no such changes are or have been seen may be classified as  $Ns$  (simple).

#### *Lepromatous Type.*

In cases of lepromatous type the involvement of the skin is usually more widespread than, and of a different nature from, the skin lesions of the neural type. Depigmented and erythematous patches may be seen but they are not, as a rule, clearly defined, nor do they show loss of sensation or thickening of nerves. There is usually a diffuse infiltration of the skin of the body, most marked on the face and ears but also present in other parts of the body, the skin being slightly thickened with a shiny appearance and velvety feeling on palpation. In more marked cases there is frequently loss of hair in the face and elsewhere, and there may be definite nodule formation.

There is frequently affection of the nasal mucous membrane with ulceration and sometimes deformity, and not infrequently the eyes are affected. In addition, there is usually some involvement of nerve trunks with some loss of sensation in the limbs and, may be, some deformity, but these changes may be slight or absent.

*Classification of lepromatous cases.*—Cases of leprosy in which any of the above changes are found are classified as being of lepromatous type even if there are also anaesthesia and deformities as a result of nerve involvement. A case in which the lepromatous lesions are relatively slight or 'localised' is classified as  $L_1$ .  $L_3$  indicates a case in which the lesions are marked and very widespread, the skin of the whole body being affected.  $L_2$  indicates condition between these two extremes.

### APPENDIX III.

#### NOTE ON DIAGNOSIS.

Thorough clinical examination will, in a great majority of cases, make diagnosis possible; bacteriological examination is rarely needed for diagnosis.

The clinical appearance of the different forms of leprosy have already been described, but it should be remembered that other diseases may closely resemble leprosy and that a sound general rule is that a diagnosis of leprosy should only be made in the presence of one of the three cardinal signs of leprosy, namely, (a) definite loss of sensation, (b) definite thickening of nerves, or (c) the finding of lepra bacilli most commonly in the skin.

#### *Loss of sensation.*

This is usually found in either or both of the following places: (a) in patches of the neural type, and (b) in the part of the limbs supplied by affected nerve trunks.

In the detection of loss of sensation tests for light touch are the most useful, the patient's eyes being closed and the patient being told to point when he feels the touch of a very thin slip of paper. Failure to respond indicates loss of sensation. In dull patients and in children some difficulty may be experienced, but can usually be overcome.

#### *Thickening of nerves.*

The thickening of a nerve may be detected by palpation of the cutaneous nerves supplying the patches or of the nerves of the limbs. It should be remembered that in many people normal nerves can be palpated, and nerves should only be stated to be thick when they are definitely thicker than the same nerve on the other side of the body, or if both sides are affected, thicker than they should be in a person of similar size and built. Thickened nerves are often tender on light palpation. Even normal nerves are tender when pressed upon.

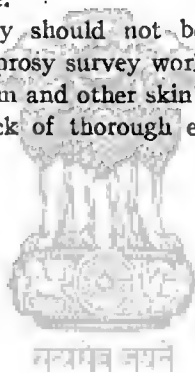
#### *Finding of lepra bacilli.*

The finding of bacilli in the skin or mucous membrane is rarely necessary for diagnosis since even in cases of lepromatous type there is usually some involvement of nerves and some loss of cutaneous sensation in the limbs, although this may occasionally be slight or absent.

Bacteriological examination is more often needed for verification of the classification of cases. Active lepromatous cases are always bacteriologically positive. Neural cases, even markedly active cases are usually but not always bacteriologically negative.

The chief difficulty encountered in diagnosis of cases in survey work arises from the fact that in most parts of India localised skin conditions of any kind are frequently treated by the application of caustics with resulting ulceration and scarring. This scarring may produce loss of sensation in the skin. When an anaesthetic patch is found it may be difficult to say whether the anaesthesia is merely caused by the scar, or whether the patch was anaesthetic before the caustics were applied. An intelligent patient may be able to give this information. Sometimes the leprosy patch and anaesthesia will be found later extending beyond the area of scarring. Sometimes a definitely thickened nerve will be found supplying the patch. Sometimes loss of sensation is marked and scarring is very slight. In such cases the diagnosis of leprosy of the neural type may be made but sometimes this is impossible.

A diagnosis of leprosy should not be made on doubtful or insufficient grounds. In leprosy survey work it is not uncommon for patches caused by ring-worm and other skin conditions to be wrongly diagnosed as leprosy. Lack of thorough examination is the usual cause of such mistakes.



## APPENDIX IV.

### BACTERIOLOGICAL EXAMINATION.

#### *Site of examination.*

There is a common idea that the best way to demonstrate bacilli is to examine smears taken from the nasal mucous membrane. This is not so. Bacilli are much more commonly found in the skin. Nasal examination may be necessary in order to judge whether a patient is highly infectious or not, but it should be done in addition to, and not instead of, examination of the skin.

Bacilli are rarely found in anaesthetic areas or in the macules of neural type, though there may be a few found in the erythematous margins of such macules. Bacilli are found in the lesions which have been described above as lepromatous, i.e., areas of slight diffuse infiltration, thickening, nodule formation, etc. In cases of lepromatous type, bacilli are very frequently found in the skin of the lobe of the ear, sometimes even in the absence of clearly visible lesions.

#### *Methods of making the smear.*

The most generally useful method of examining the skin is known as the 'slit' method. Take up a fold of the suspected skin between the thumb and fore-finger of the left hand, maintaining pressure to prevent bleeding, and with a sharp scalpel held in the right hand, make a slit vertically downwards into the corium. With point of the scalpel scrape the bottom and sides of the slit, collecting material on the point of scalpel. Tissue cells, not blood are required. If there is excess of bleeding, wipe away the blood before scraping. Make a smear of the scraping on a slide, fix by heat, stain and examine.

In nasal examination, inspect the nasal septum for lesions, take a scalpel and scrape away cells, not blood or mucous, from the septum near the anterior end of the inferior turbinate bone; make a smear on a slide, fix and stain.

#### *Staining and examination of smears.*

The method of staining used is that of Ziehl Neelsen which is described in many text-books. The most important thing is that the stain shall be properly made, the basic fuchsin being ground in a mortar with a pestle to get proper solution in the absolute alcohol. It is not necessary to heat the slide in order to stain the bacilli, for if the stain is properly made, the bacilli will be stained in the cold in

about twenty minutes. Watery acid or alcohol may be used for decolorisation, and decolorisation should not be carried too far, and should leave the film still pink. For counter-stain a strong watery solution of methylene blue is best.

When examining slide it is important to remember that other things besides bacilli may appear red; certain granules in some cells stain red, fragments of horny epidermis stain red, deposited stain is red. The bacilli are characteristic in size and colour and there should be no doubt about the genuineness of the bacilli seen. A safe rule is, 'If there is doubt, it is not a bacillus'. Bacilli, if present are usually fairly numerous, often very numerous. If only one or two bacilli are found in a smear, it is advisable to repeat the examination in order to verify the finding.





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